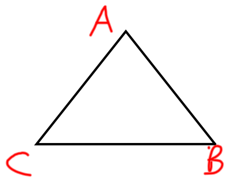
5.4 The Triangle Inequality

Thm. 5.11-- <u>The triangle inequality theorem</u> --the sum of the lengths of any 2 sides of a triangle is greater than the length of the 3rd side.

$AB + BC > AC$

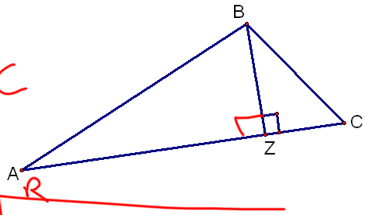
$BC + AC > AB$

$AC + AB > BC$



Let's Prove it.

$AB + BC > AC$



S.	R.
① $AB > AZ$, $BC > ZC$	① Thm 5.10
② $AB + BC > AZ + ZC$	② Add.
③ $AZ + ZC = AC$	③ Segm. Add Post
④ $AB + BC > AC$	④ Subst.

Do the lengths represent a triangle?

4, 5, 7	$4 + 5 > 7$ ✓	yes
13, 12, 20	$13 + 12 > 20$ ✓	yes
7, 14, 21	$7 + 14 = 21$	No
7, 7, 7		yes
8, 8, 19	$16 < 19$	no

Two sides of a triangle are 6 and 11.
What is the range of the 3rd side?

$6+11 > x$

$17 > x$

$6+x > 11$

$x > 5$

$11+x > 6$

$x > -5$

$5 < x < 17$

Two sides of a triangle are 12 and 18.
What is the range of the 3rd side?

$6 < x < 30$

Distance Formula
A(0, 5)
B(8, 2)
C(4, 3.5)

} collinear

Is this a Δ? No

$AB = \sqrt{(8-0)^2 + (2-5)^2} \approx 8.544$

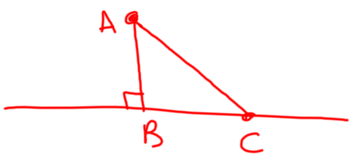
$64 + 9$ $\quad \sqrt{73}$

$BC = \sqrt{4^2 + (3.5-2)^2}$ $\quad \sqrt{18.25} \approx 4.272$

$(1.5)^2$

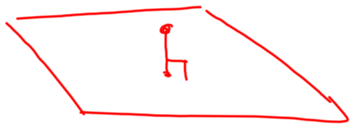
$CA = \sqrt{4^2 + (1.5)^2}$ $\quad \sqrt{18.25} \approx$

Thm 5.12--Shortest distance from a point to a line is a perpendicular segment

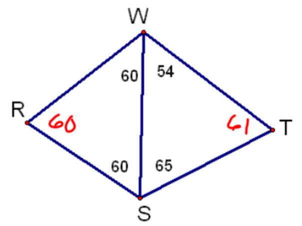


$\overline{AB}$ is shortest path

Corollary 5.1--shortest distance from a point to a plane is a perpendicular segment



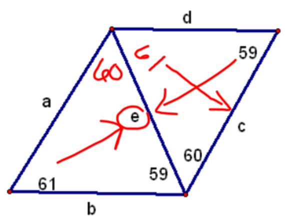
What is the longest segment? WT



RW = WS = RS

WT > WS > ST

What is the longest segment? C



e > b > a

c > d > e

HW

p264-265

15-35odd, 38,41, 43